# NICE$^3$ Technical Periodic Report

## Report #8

## September 15, 2002

### 1. Title / State / Company

Precision Irrigation Technologies for the Agricultural Industry
Colorado Office of Energy Management and Conservation
Colorado Corn Administrative Committee

### 2. Periodic Activity Summary - In a narrative format, briefly describe the technical progress for the period.

All marketing and communication products have been completed and are currently being used to actively promote the project. Ongoing activities at both the Wiggins and Yuma demonstration sites include scouting fields, taking aerial photos, reading soil moisture blocks, and testing irrigation wells for gallons, draw down, and efficiency. Resulting data continues to be used for developing management zones and strategies.

Uniformity of coverage tests in the field were made for the AccuPulse, aerial, and ground applicators. Installation of the complete 7 span AccuPulse System in the lab that was completed this summer will enable thorough evaluation of uniformity of applied volumes for 130-acre fields. These are important components of the field assessment and evaluation for completing the 2002 work.

Assessment and modification of the operation of the AccuPulse System is ongoing and technical improvements continue to be made as a result of the work at both demonstration sites. We are encouraged by the performance of the AccuPulse System thus far and look forward to continuing to refine the product during the course of this project.

### 3. Milestone Table

#### a) Describe technical progress for the period, with ongoing activities and discuss the actions taken to meet the milestone deadlines.

Uniformity of coverage tests were conducted on the AccuPulse System at Wiggins on 6-18-02 using water sensitive cards. Leaf samples were collected before and after fungicide applications with the AccuPulse and the chemigation systems on 6-18-02 and 6-25-02 to determine the amount of fungicide applied as well as the redistribution of fungicide within the canopy under subsequent irrigations. These samples have not yet been analyzed with gas chromatography. Uniformity of coverage tests were conducted on 7-17-02 for aerial application of fungicides and on 8-29-02 for a ground applicator.

A complete 7 tower AccuPulse System has been set up in the lab to enable evaluation of uniformity of applied volumes and chemical for entire 130-acre fields. We are awaiting installation of 2 pressure transducers before starting these full-scale tests.

Additionally, we collected more detailed application coverage data (using 30 artificial plants in place of corn) from AccuPulse and ground sprayer at our office location in Fort Collins, where we previously installed an AccuPulse System on a two-tower center pivot system.

Servi-Tech has been making weekly visits to both demonstration sites, mainly scouting the management zones for weeds, insects, disease, and plant health to determine if there are differences or similarities between zones. We also had a set of aerial photos taken on each field in July.

Y-W Well Testing Association has been reading the soil moisture blocks (gyp blocks) for the growing season. We have also tested the irrigation well several times for gallons, draw down, and efficiency.

During this period, all communications milestones were completed. The Irrigation Precision Technologies Trade Show Display was finished and has been viewed at the Colorado Livestock Convention, August 7-9, 2002 and at the Yuma Farm Show August 21-22, 2002. The Irrigation Precision Technologies PowerPoint Presentation is complete. The Irrigation Precision Technologies Video production was combined with the PowerPoint presentation to provide an interactive media event that can be self-viewed at trade shows or on the web site. All materials are in the hands of the Colorado Corn Growers. Attached to the Technical Report include a picture of the Trade Show Display as well as an attachment of the PowerPoint Presentation slides.

**b) Provide an explanation of technical difficulties encountered while testing, installing, or operating the system.**

i. On June 17th Quality Irrigation found that the AccuPulse System at the Wiggins site had developed several electrical shorts in the control wiring harness. When an electrical short occurs the entire system shuts down. The corrosive water has created a very abrasive surface on many of the components of which the wiring harness is attached. The movement of the wiring harness against these surfaces is caused primarily by the wind. With the exception of the last application, the Wiggins system had preformed flawlessly since the shorts were repaired. It appears a new short had developed on the last application.

ii. Two varieties of potatoes were planted, one held up well in the extreme heat, the other variety deteriorated substantially as the summer progressed. At the time of the aerial photo, the distinction between the two varieties was so great that it only showed two extreme degrees of plant health, basically alive or dead.

iii. Y-W Well Testing was not able to test the static water level and pumping water level at the Yuma site because the pump location within the well casing has moved and restricts access. The pump goes into the well casing and the small access hole that for measuring the static water level and the pumping water level has moved, thus it is impossible to perform these tests.

**c) Explain the steps taken to resolve these difficulties.**

i. Quality Irrigation suggests the installation of a wiring harness with a wire coating that will prove more resistant to the elements. Quality Irrigation will update both AccuPulse Systems this winter; exact modifications have yet to be determined.

ii. The aerial photo is not the best measuring tool in times of extreme heat/drought because it failed to show a variation of plant health. The best tool for measuring the degree of plant health was to walk through the field rather than to use the aerial photo.

iii. The owner of the Yuma site has been contacted to move the pump, which will allow access for Y-W Well Testing. Y-W Wells is following up with the pump owner to ensure that the pump is moved before winter.

**d) Describe any known or potential changes in milestone dates.**

Colorado Corn is anticipating the need for an extension of one year for milestones 10-17, which would allow for the Final Report to be submitted 11-31-04. Reasons for the extension include weather difficulties including hail and drought as well as personnel changes and mechanical difficulties with the AccuPulse System at the Yuma site. An official request for the amendment to the grant contract is pending.

**e) Address activities and planned accomplishments for the upcoming quarter.**

Once the corn is harvested at Yuma, Servi-Tech will compare yield maps with the aerial photos and determine if the management zones need any further adjustments. With both this year and last year's aerial photos Servi-Tech will be able to finalize where the management zone boundaries need to be at each site. Servi-Tech will also pull soil samples on both fields after the crops come off, if weather allows (frost); otherwise, soil samples will be pulled in the spring.

USDA-ARS will do an extensive test on the full 7 tower AccuPulse System set up in the lab evaluating both the uniformity of applied volumes as well as the uniformity of applied chemical. Similar tests will be conducted on the AccuPulse installed on the two-tower system.

Y-W Well Testing is in the process of compiling seasonal data from both demonstration sites. Y-W will also be doing the soil compaction studies for the producers this fall and will be taking

soil samples and computing the information. This is very helpful to the producers for the up-coming growing season.

**4. Discuss results (testing etc.) and their implications to the project. Discuss any necessary or anticipated milestone additions or deletions.**

The AccuPulse System was used 8-10 times to apply fungicide on the north half of the Wiggins field while the regular practice of chemigating was used on the south half to compare the two methods. The potatoes at the Wiggins site were stressed this summer and showed a poor water pattern related to the sprinkler, but this is not an indication of the field's qualities (soil type). With the exception of improvements like a more durable wiring harness and other corrosion related incidents the dependability of the AccuPulse System is quite good. There were no discernible differences in crop performance between traditional chemigating and using the AccuPulse System, and the producer stated he liked the AccuPulse System.

Preliminary results show that producers can save water and energy on the crops that are raised for the growing season using the AccuPulse System. A comparison of three application methods for uniformity of coverage and amount of chemical residue on the plants as well as an evaluation of the uniformity over a complete field will be important findings from this project to help commercialize the AccuPulse System.

**5. Attach publications written that relate to the project (internally or externally produced). List any planned publications or conferences to be attended related to the project for the next quarter.**

Y-W Wells produced data tables of their readings, these tables are attached.

**6. Discuss any key personnel changes (including state, cost-share, subgrantee, and others involved).**

One of the Y-W Well Testing Association team members will be retiring as of January 1, 2003. This will not change the focus of the rest of the team.

Joyce Wallace, former Natural Resources Director, is no longer with Colorado Corn.

John Cevette, Executive Director and Beth Weibert are new employees at Colorado Corn.

**7. Discuss any cost-sharing partner/demonstration partner changes.**

There are no changes to the cost-sharing partner/demonstration partner changes at this time.

**8. Discuss any other topics that are relevant to the scope and progress of the project.**

Y-W Well Testing gave a presentation on irrigation pumps at a Tri-State Distributor meeting and had a meeting with the Governor's Office of Energy Conservation to find ways to save water and energy in our state. Y-W also gave a tour for the state NRCS Conservationist showing him some of the irrigation projects the team is involved in. Members of the Y-W Well Testing team are on the Ogallala Aquifer Symposium committee, which is focused on saving water and energy out of the Ogallala Aquifer. Y-W also continues to work with the Core 4 and Irrigation Research Farm.